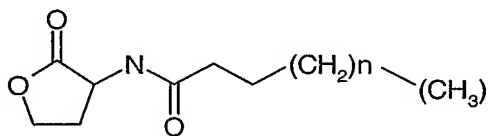
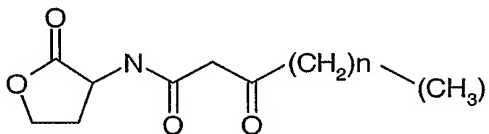


**CLAIMS**

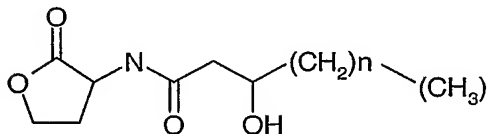
1. A method of causing autolysis of a population of gram-negative bacteria, said method comprising administration to the population of an antibody to a lactone or  
5 lactone-derived signal molecule secreted by gram-negative bacteria so as to cause an imbalance in the ratio of homoserine lactone (HL) signal molecule to quinolone signal (QS) signal molecule in the environment of the population of the gram-negative bacteria.
- 10 2. A method as claimed in claim 1, in which the homoserine lactone (HL) signal molecule is a homoserine lactone molecule with a formula selected from the group consisting of:



Formula (I)



Formula (II)



Formula (III)

15

where  $n = 0$  to 12.

3. A method as claimed in claim 2, in which the homoserine lactone molecule of  
20 general formula (I) is *N*-butanoyl-L-homoserine lactone (BHL) where  $n = 0$ , *N*-dodecanoyl-L-homoserine lactone (dDHL) where  $n = 8$  and *n*-tetradecanoyl-L-homoserine lactone (tDHL) where  $n = 10$ .

4. A method as claimed in claim 2, in which the homoserine lactone molecule of general formula (II) is *N*-(-3-oxododecanoyl)-L-homoserine lactone (OdDHL) where  $n = 8$  or *N*-(-3-oxohexanoyl)-L-homoserine lactone (OHHL) where  $n = 2$ .

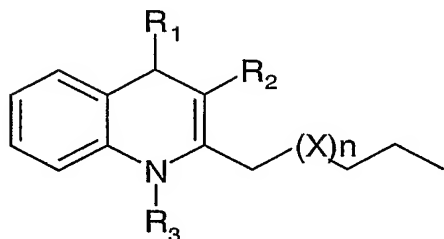
5

5. A method as claimed in claim 2, in which the homoserine lactone molecule of general formula (III) is *N*-(-3-hydroxybutanoyl)-L-homoserine lactone (HBHL) where  $n = 0$ .

10 6. A method as claimed in claim 2, in which the lactone signal molecule is OdDHL and/or BHL.

7. A method as claimed in any preceding claim, in which the quinolone signal (QS) signal molecule is a molecule of general formula (IV):

15



where  $n$  is 1 to 7,

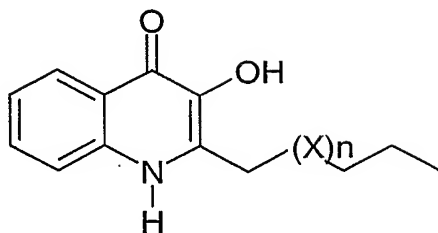
$R_1$  is  $=O$ , or  $-H$ ,

20  $R_2$  is  $-OH$ , or  $-H$ , and

$R_3$  is  $-H$ , or alternatively, the nitrogen atom (N) is unsubstituted.

8. A method as claimed in claim 7, in which the quinolone signal molecule of general formula (IV) is

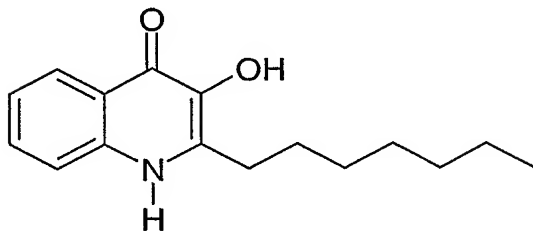
25



2-acyl-3-hydroxy-4-quinolone

9. A method as claimed in claim 8, in which the 2-acyl-3-hydroxy-4-quinolone is 2-heptyl-3-hydroxy-4-quinolone

5



10. A method as claimed in any preceding claim, in which the gram negative bacteria is *Pseudomonas aeruginosa* and the ratio of bacterial signal molecules is acyl-homoserine lactone (AHL) signal molecule of formula (I) to *Pseudomonas* quinolone signal (PQS) signal molecule.

11. A method as claimed in any preceding claim, in which the antibodies are monoclonal or polyclonal antibodies, or fragments thereof.

12. A method as claimed in claim 11 in which the antibody fragments are single chain antibody fragments (scAbs).

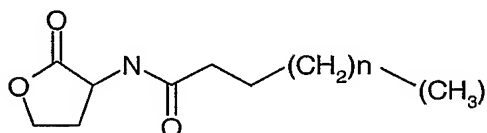
13. A method as claimed in claim 12, in which the single-chain antibodies (scAbs) are G3H5, G3B12, G3G2 and/or G3H3 deposited as NCIMB-41167, NCIMB-41168, NCIMB-41169, NCIMB-41170, respectively.

14. A method for the treatment of an infection of gram-negative bacteria in a subject, said method comprising administration to the subject of an antibody to a

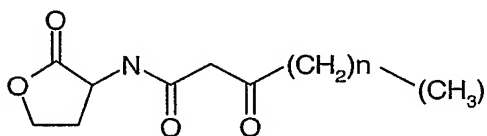
lactone or lactone-derived signal molecule secreted by gram-negative bacteria so as to cause an imbalance in the ratio of homoserine lactone (HL) signal molecule to quinolone signal (QS) signal molecule in the environment of the gram-negative bacteria.

5

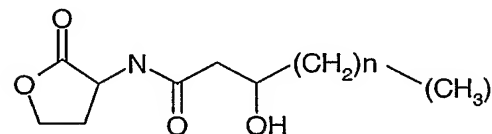
15. A method as claimed in claim 14, in which the homoserine lactone (HL) signal molecule is a homoserine lactone molecule with a formula selected from the group consisting of:



Formula (I)



Formula (II)



Formula (III)

10

where  $n = 0$  to 12.

15 16. A method as claimed in claim 15, in which the homoserine lactone molecule of general formula (I) is *N*-butanoyl-L-homoserine lactone (BHL) where  $n = 0$ , *N*-dodecanoyl-L-homoserine lactone (dDHL) where  $n = 8$  and *n*-tetradecanoyl-L-homoserine lactone (tDHL) where  $n = 10$ .

20 17. A method as claimed in claim 15, in which the homoserine lactone molecule of general formula (II) is *N*-(-3-oxododecanoyl)-L-homoserine lactone (OdDHL) where  $n = 8$  or *N*-(-3-oxohexanoyl)-L-homoserine lactone (OHHL) where  $n = 2$ .

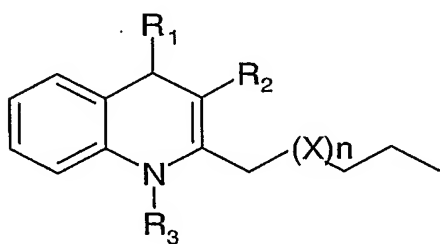
18. A method as claimed in claim 15, in which the homoserine lactone molecule of general formula (III) is *N*-(3-hydroxybutanoyl)-L-homoserine lactone (HBHL) where  $n = 0$ .

5

19. A method as claimed in claim 15, in which the lactone signal molecule is OdDHL and/or BHL.

20. A method as claimed in any one of claims 14 to 19, in which the quinolone signal (QS) signal molecule is a molecule of general formula (IV):

10



where  $n$  is 1 to 7,

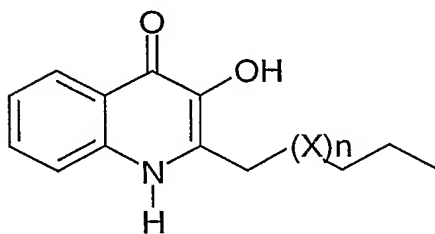
15  $R_1$  is  $=O$ , or  $-H$ ,

$R_2$  is  $-OH$ , or  $-H$ , and

$R_3$  is  $-H$ , or alternatively, the nitrogen atom (N) is unsubstituted.

21. A method as claimed in claim 20, in which the quinolone signal molecule of general formula (IV) is

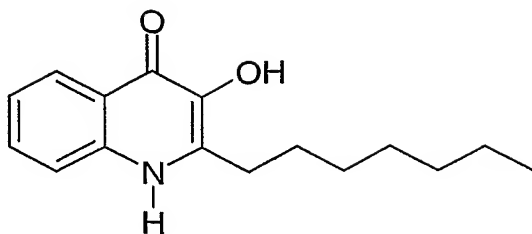
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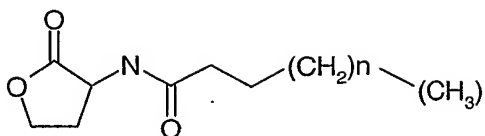
2-acyl-3-hydroxy-4-quinolone

22. A method as claimed in claim 21, in which the 2-acyl-3-hydroxy-4-quinolone is 2-heptyl-3-hydroxy-4-quinolone

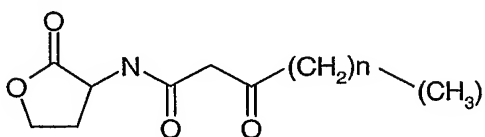
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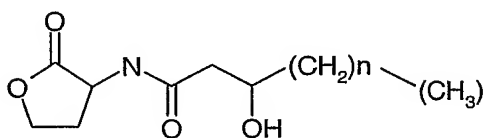
- 5 23. A method as claimed in any one of claims 14 to 22, in which the gram negative bacteria is *Pseudomonas aeruginosa* and the ratio of bacterial signal molecules is acyl-homoserine lactone (AHL) signal molecule of formula (I) to *Pseudomonas* quinolone signal (PQS) signal molecule.
- 10 24. A method as claimed in any one of claims 14 to 23, in which the antibodies are monoclonal or polyclonal antibodies, or fragments thereof.
25. A method as claimed in claim 24 in which the antibody fragments are single chain antibody fragments (scAbs).
- 15 26. A method as claimed in claim 25, in which the single-chain antibodies (scAbs) are G3H5, G3B12, G3G2 and/or G3H3 deposited as NCIMB-41167, NCIMB-41168, NCIMB-41169, NCIMB-41170, respectively.
- 20 27. An antibody to a lactone or lactone-derived signal molecule secreted by gram-negative bacteria for use in causing autolysis of gram-negative bacteria.
28. An antibody for use as claimed in claim 27, in which the lactone or lactone-derived signal molecule is a homoserine lactone molecule with a formula selected
- 25 from the group consisting of:



Formula (I)



Formula (II)



Formula (III)

where  $n = 0$  to 12.

5

29. An antibody for use as claimed in claim 28, in which the homoserine lactone molecule of general formula (I) is *N*-butanoyl-*L*-homoserine lactone (BHL) where  $n = 0$ , *N*-dodecanoyl-*L*-homoserine lactone (dDHL) where  $n = 8$  and *n*-tetradecanoyl-*L*-homoserine lactone (tDHL) where  $n = 10$ .

10

30. An antibody for use as claimed in claim 28, in which the homoserine lactone molecule of general formula (II) is *N*-(-3-oxododecanoyl)-*L*-homoserine lactone (OdDHL) where  $n = 8$  or *N*-(-3-oxohexanoyl)-*L*-homoserine lactone (OHHL) where  $n = 2$ .

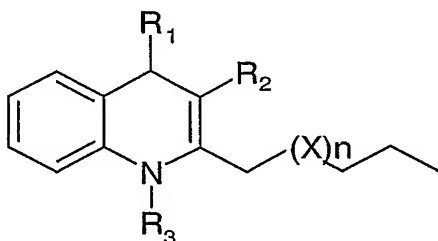
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31. An antibody for use as claimed in claim 28, in which the homoserine lactone molecule of general formula (III) is *N*-(-3-hydroxybutanoyl)-*L*-homoserine lactone (HBHL) where  $n = 0$ .

20

32. An antibody for use as claimed in claim 28, in which the lactone signal molecule is OdDHL and/or BHL.

33. An antibody for use as claimed in any one of claims 27 to 32, in which the quinolone signal (QS) signal molecule is a molecule of general formula (IV):



5

where n is 1 to 7,

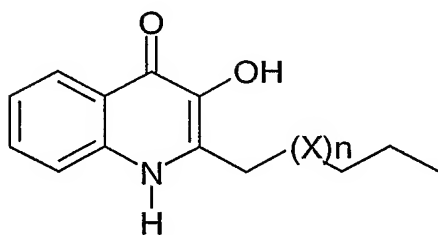
R<sub>1</sub> is =O, or -H,

R<sub>2</sub> is -OH, or -H, and

R<sub>3</sub> is -H, or alternatively, the nitrogen atom (N) is unsubstituted.

10

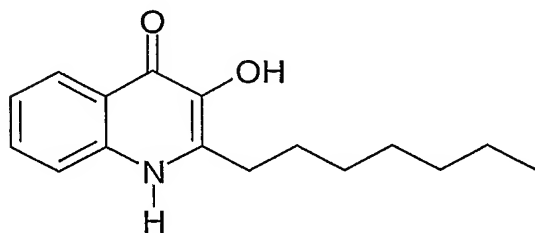
34. An antibody for use as claimed in claim 33, in which the quinolone signal molecule of general formula (IV) is



2-acyl-3-hydroxy-4-quinolone

15

35. An antibody for use as claimed in claim 34, in which the 2-acyl-3-hydroxy-4-quinolone is 2-heptyl-3-hydroxy-4-quinolone



20



36. An antibody for use as claimed in any one of claims 27 to 35, in which the gram negative bacteria is *Pseudomonas aeruginosa* and the ratio of bacterial signal molecules is acyl-homoserine lactone (AHL) signal molecule of formula (I) to *Pseudomonas* quinolone signal (PQS) signal molecule.

5

37. An antibody for use as claimed in any one of claims 27 to 36, in which the antibodies are monoclonal or polyclonal antibodies, or fragments thereof.

38. An antibody for use as claimed in claim 37 in which the antibody fragments  
10 are single chain antibody fragments (scAbs).

39. An antibody for use as claimed in claim 38, in which the single-chain antibodies (scAbs) are G3H5, G3B12, G3G2 and/or G3H3 deposited as NCIMB-41167, NCIMB-41168, NCIMB-41169, NCIMB-41170, respectively.

15

40. The use of an antibody to a lactone or lactone-derived signal molecule secreted by gram-negative bacteria in the preparation of a medicament for the treatment of an infection of gram-negative in a subject, in which the antibody causes autolysis of the gram-negative bacteria which infect said subject